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(54) INK JET RECORDING SHEET

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an ink jet recording sheet which shows high surface gloss, excellent ink absorption and color development properties and further superb scratch-resistance.
SOLUTION: This ink jet recording sheet has an ink receiving layer consisting of a pseudoboehmite-like alumina hydrate, formed on a support. This ink receiving layer has a protecting layer containing pearl necklace-like silica particles, formed on the layer. The particle diameter of the spherical primary particles of the pearl necklace-like silica is 5-100 nm, preferably 8-60 nm. The particle diameter of the pearl necklace-like silica particles is 30-800 nm, preferably 80-500 nm and in the case of the latter, especially satisfactory results are obtained.

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CLAIMS

[Claim(s)]
[Claim 1] The ink jet record sheet characterized by having a protective layer containing the silica particle which is the ink jet record sheet which prepared the ink acceptance layer which uses pseudo-boehmite-like hydrated alumina as a principal component on the base material, and has a pearl necklace-like configuration on this ink acceptance layer.
[Claim 2] The ink jet record sheet according to claim 1 with which the pearl necklace silica particle of the above is characterized by for two or more with a 5nm or more particle diameter [100nm or less] spherical primary particles joining together, and having 30nm or more particle diameter of 800nm or less.
[Claim 3] The ink jet record sheet according to claim 1 with which the pearl necklace silica particle of the above is characterized by for two or more with a 8nm or more particle diameter [60nm or less] spherical primary particles joining together, and having 80nm or more particle diameter of 500nm or less.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the ink jet record sheet with which especially the request by color record has the gloss of a high photographic-printing-paper tone, or an ink jet record sheet with high transparency usable as an OHP film about the ink jet record sheet used for the printer using an ink jet recording method, or a plotter.
[0002]
[Description of the Prior Art] In recent years, an image full color and high definition moreover has come to be easily obtained by **** better ****** of an ink jet printer or a plotter. In connection with this, it is anxious for development of ink jet record sheets other than the paper of fine quality for a certain ink jet record, or coated paper from the former.
[0003] An ink jet recording method makes the minute drop of ink fly by various working principles, is made to adhere to record sheets, such as paper, and records an image, an alphabetic character, etc. It excels in high-speed printing nature or low noise nature, and the versatility of a record pattern is large, development-fixing has the features, such as needlessness, and the ink jet printer and the plotter attract attention at the point which can form a complicated image correctly and quickly. As a hard copy listing device of image information, such as an alphabetic character created especially by computer, and various graphic forms, it has spread quickly in various applications in recent years. Moreover, it is also easy by using two or more ink nozzles to perform multicolor record. By the multicolor ink jet method, it is possible for the color picture formed to acquire equal record as compared with the print by process printing by the platemaking method or the

color photography method, and it is widely applied from being cheap and ending rather than being based on a printing technique or a photograph technique in an application with still few creation number of copies.

[0004] Recently, the ink jet printer which can output the high definition image which is equal to the image of a film photo is cheap, and is marketed. Since the ink jet record sheet is very cheap while the image of this quality is obtained compared with a film photo method, it has a big merit economically for the user who exchanges a display image frequently with an advertisement, a sample, etc. of a large area which need an image. Moreover, creating an image on the personal computer which is becoming general recently, and looking at print-out for this, by the conventional film photo method, correcting a color scheme and a layout also has the advantage in which such actuation can be performed freely, by ink jet record, although it was completely impossible.

[0005] As a record sheet used by the ink jet recording method, efforts have been made from equipment or the field of an ink presentation so that the usual paper of fine quality for printing or a note and coated paper can be used. However, a more advanced property came to be required also from the record sheet with improvement in engine performance of an ink jet recording device, such as improvement in the speed and highly-minute-izing, or full-color-izing, or expansion of an application. That is, when the concentration of a printing dot being high as the record sheet concerned, and a color tone's being brightly skillful and absorption of ink are quick and a printing dot laps, ink flows out or it spreads, or the diffusion to the longitudinal direction of not carrying out and a printing dot is not large beyond the need, and it is required that the circumference should be smooth and should not fade etc. Especially in color record, the color overlapping record which piles up not only monochrome record of yellow Magenta cyanogen black but these colors is made, and since ink coating weight increases further, the very severe engine performance is required.

[0006] In recent years as an ink jet record sheet with which ink rate of absorption was quick with a record sheet, and raised glossiness The ink jet record sheet using hydrated alumina is proposed. For example, JP,60-232990,A, 60-245588, JP,3-24906,B, JP,2-276670,A, 3-215082, 4-37576, 4-67986, 5-16517, 5-24335, 5-32037, 5-50739, 5-286228, 5-301441, 6-48016, 6-55829, 6-183126, 6-184954, 6-199034, 6-199035, said -- 6-218324, 6-255235, and 6-262844 -- 6-270530, 6-286297, 6-297831, 6-297832, 6-316145, 7-68919, The ink jet record sheet which carried out coating of the detailed alumina sol to the support surface with the water-soluble binder as indicated by 7-68920, 7-76161, 7-82694, 7-89221, the 7-172038 official report, etc. is indicated.

[0007] These ink jet record sheets are excellent in respect of image quality and gloss, and very desirable. However, the front face of the ink acceptance layer which consists of these hydrated alumina has the fault of being very easy to attach a blemish, and had a possibility of spoiling the quality of a record object remarkably only by rubbing in cloth, paper, etc.

[0008] As a means to solve this, there is a method of preparing the protective layer which used colloidal silica on an ink acceptance layer like a JP,7-76162,A publication. However, since restoration of the particle of a protective layer became dense in the case of the protective layer using the colloidal silica of a general spherical particle, the protective layer checked osmosis of ink and had the fault that an image got worse as a result.

[0009] As an approach of furthermore improving this, the approach using the colloidal silica which has a chain-like configuration is shown like the JP,10-166715,A publication. However, although improved rather than the case where spherical colloidal silica is used also in this case, the improvement of osmosis of ink was still inadequate.
[0010]
[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering the ink jet record sheet which has high surface gloss and the outstanding ink absorptivity, and color enhancement, and was excellent in abrasion-proof nature. It is offering the record sheet-ed for ink jets with which it has in more detail the ink acceptance layer which consists of pseudo-boehmite-like hydrated alumina, and the request by color record has the gloss of a high photograph tone, or an ink jet record sheet with high transparency usable as an OHP film.
[0011]
[Means for Solving the Problem] The technical problem of this invention was solvable with the means expressed below. That is, it is the ink jet record sheet characterized by having a protective layer containing the silica particle which prepares the ink acceptance layer which consists of pseudo-boehmite-like hydrated alumina on a base material, and has a Park necklace-like configuration on it.
[0012] Abrasion-proof nature, surface gloss, ink absorptivity, color enhancement, etc. become better by using the silica particle of the shape of a pearl necklace in which two or more with a 5nm or more particle diameter [100nm or less] spherical primary particles join together, and have 30nm or more particle diameter of 800nm or less especially.
[0013] Furthermore, by using the silica particle of the shape of a pearl necklace in which two or more with a 8nm or more particle diameter [60nm or less] spherical primary particles join together, and have 80nm or more particle diameter of 500nm or less, abrasion-proof nature, surface gloss, ink absorptivity, color enhancement, etc. become better, and are especially desirable.
[0014]
[Embodiment of the Invention] Below, the component and its manufacture approach of an ink jet record sheet of this invention are explained at a detail. The ink jet record sheet of this invention prepares the ink acceptance layer which consists of pseudo-boehmite-like hydrated alumina on a base material, and has the protective layer which mainly contains a pearl necklace-like silica particle on it.
[0015] In the ink jet record sheet of this invention, the ink acceptance layer mainly has the function which absorbs ink and is established in coloring matter, and a protective layer has the function to protect an ink acceptance layer from a blemish. Therefore, the ink from an ink jet printer penetrates a protective layer, and permeates even a hydrated alumina layer, and it is fixed to coloring matter in an ink acceptance layer. Therefore, abrasion-proof [1] nature, 2 coat surface gloss, 3 ink permeability, 4 coat transparency, etc. are required of a protective layer.
[0016] It is the description that the silica particle which constitutes the protective layer concerning this invention is a pearl necklace-like. To existing independently, without generally the particle of a near configuration connecting the particle shape of colloidal silica spherically or spherically, a spherical primary particle connects two or more pearl necklace-like silica particles concerning this invention, and they point out what has the configuration which resembled the pearl necklace literally.

[0017] Although each of above-mentioned chain-like particles and pearl necklace-like particles is long and slender configurations which the primary particle of a silica connected and which have branching, the difference among both is in the rate that a spherical primary particle occupies. The pearl necklace-like particle concerning this invention means that with which the circle-like graphic form resulting from a spherical primary particle has 70% or more of roundness, the sum total area of the inscribed circle of each circle-like graphic form occupies 70% or more of pearl necklace-like particle all projected area, and the inscribed circle of each circle-like graphic form does not lap mutually in the secondary subject copy by the electron microscope. Here, it is expressed with the ratio of the radius of the inscribed circle to the radius of the circumscribed circle of the target graphic form profile roundness, and becomes 100% in a perfect circle.
[0018] Ink absorptivity becomes good by using a pearl necklace-like silica particle for a protective layer rather than the case where usual spherical colloidal silica or the usual . above-mentioned chain-like colloidal silica is used. It is thought that it is because voidage becomes [the direction which used the pearl necklace-like silica particle] high more as the reason and osmosis of ink becomes good. Moreover, in order to obtain the mechanical strength of a coat to a protective layer, binders, such as a water-soluble polymer, are added in many cases, but the coat which consists of a pearl necklace-like silica particle is excellent also in the mechanical strength, and since there are few additions of a binder as compared with the case where other colloidal silica is used and it ends, it can make voidage high further.
[0019] Moreover, since the mechanical strength of a coat is excellent, there are few amounts of need coating of a protective layer, and they end. Consequently, the haze (muddiness by light scattering) by the protective layer becomes low, the color enhancement of printed matter improves, and it is desirable.
[0020] About the pearl necklace-like silica particle concerning this invention, if particle size is small, voidage will become low, and the size of the opening which particle size produces among large grain children becomes large, and there is an inclination for the haze of a protective layer to get worse. Therefore, 30nm or more 800nm or less of 80nm or more things 500nm or less is used still more preferably preferably. 100nm or more thing 200nm or less is good also especially in it.
[0021] Also about the spherical primary particle of the pearl necklace-like silica particle concerning this invention, if particle size is small, voidage will become low, and the size of the opening which particle size produces among large grain children becomes large, and there is an inclination for the haze of a protective layer to get worse. Therefore, 5nm or more 100nm or less of 8nm or more things 60nm or less is used still more preferably preferably. 18nm or more thing 40nm or less is good also especially in it.
[0022] Although it can use for this invention if the silica particle has the shape of a pearl necklace no matter the silica particle of the shape of a pearl necklace concerning this invention may be obtained by various approaches and it may be obtained by what approach in this invention, it is obtained by adding the cation more than divalent and ripening it so that it may consider as the formation approach of a pearl necklace-like silica particle, for example, general spherical colloidal silica may connect in the shape of a pearl necklace.
[0023] Moreover, as a silica particle of the shape of a commercial pearl necklace, an acid type, a cation denaturation type, etc. which are the variation of Snow tex-PS made from

the Nissan chemistry and this product, for example are mentioned.
[0024] The silica particle of the shape of a pearl necklace concerning this invention In the coating liquid for forming the protective layer in the ink jet record sheet of this invention at least Preparation of the coating liquid for protection stratification is preceded that what is necessary is just to exist in the pearl necklace-like configuration. The silica particle of the shape of a pearl necklace which starts this invention including the above-mentioned approach is prepared. The coating liquid for protection stratification may be prepared using this, and you may prepare coating liquid, preparing the silica particle of the shape of a pearl necklace which starts this invention including the above-mentioned approach in coating liquid at the time of the coating liquid preparation for protection stratification.
[0025] In this invention, although the device whose abrasion-proof nature as these whole layer improves by preparing a protective layer on the ink acceptance layer which uses pseudo-boehmite-like hydrated alumina as a principal component is not clear, it is surmised that it is because the film strength of a protective layer is excellent compared with it of the ink acceptance layer of hydrated alumina. Although the purpose may be able to be attained also by mixing a silica particle in the ink acceptance layer of hydrated alumina, and considering as a configuration further, since ink absorptivity and abrasion-proof nature are inferior to the case where it considers as a bilayer configuration also in the ink jet record sheet which a distributed condition etc. tended to become unstable, and did so, and was obtained, the coating liquid which mixed alumina sol and a silica sol is not desirable.
[0026] It is also possible to use together pearl necklace-like silica particle, other silica particle, i.e., spherical colloidal silica, and chain-like colloidal silica etc. at a rate of arbitration in this invention.
[0027] Moreover, tactile feeling on the front face of a sheet also improves by preparing a protective layer. Probably because sebum would be absorbed if a hydrated alumina layer is touched with a direct finger etc. when not preparing a protective layer, there was an unpleasant feel at which a fingertip sticks to a sheet. However, it is greatly mitigated by preparing a protective layer upwards. Furthermore, since surface slipping becomes good, ****** to a printer and the handling nature at the time of treating a lot of number of sheets also improve.
[0028] as the dispersion medium of the silica particle which starts this invention although the protective layer concerning this invention applies silica sol coating liquid on the ink acceptance layer which consists of pseudo-boehmite-like hydrated alumina, it dries and it is obtained -- water -- being independent -- it may carry out, and a water-soluble organic solvent, for example, a methanol, ethanol, 2-propanol, 2-methoxyethanol, ethylene glycol, propylene glycol, dimethylacetamide, etc. may be mixed and used for water. Furthermore, in the production process of the pearl necklace-like silica particle concerning this invention, the organic solvent distribution type (ORGANO silica sol) which permuted water by the water-soluble above-mentioned organic solvent can also be used. Since the dissolution of the binder in the ink which uses water as the main solvent since an insoluble binder can also be used together in water when using the ORGANO silica sol, and swelling can be prevented, it is desirable.
[0029] The protective layer concerning this invention may use a binder together to silica solid content by making about 100 % of the weight into an upper limit. In order to worsen the ink absorptivity of an ink jet record sheet if many [too] although the abrasion-proof

nature of a protective layer improves, so that there are many binder additions, the above-mentioned range is desirable. Furthermore, by making a binder into 1 - 30 % of the weight to silica solid content, the balance of ink absorptivity and abrasion-proof nature is good, and desirable.

[0030] As a binder used for the protective layer concerning this invention, various polymers can be chosen according to a solvent. When a solvent is water, for example, methyl cellulose, methyl hydroxyethyl cellulose, Cellulose system binders, such as methyl hydroxypropylcellulose and hydroxyethyl cellulose, Starch and its denaturation object, gelatin and those denaturation objects, casein, Naturally-ocurring-polymers resin or these derivatives, such as a pullulan, gum arabic, kadaya gum, and albumin, Polyvinyl alcohol and its denaturation object, an SBR latex, an NBR latex, Latexes and emulsions, such as a methyl methacrylate-butadiene copolymer and an ethylene-vinylacetate copolymer, Although vinyl polymer, such as polyacrylamide and a polyvinyl pyrrolidone, polyethyleneimine, a polypropylene glycol, a polyethylene glycol and a maleic anhydride, or its copolymer can be mentioned, this invention is not limited to these.

[0031] Although it is desirable as the method of application of the coating liquid for protection stratification in this invention to use a direct gravure method, the methods of application usually used, such as the other micro gravure method, a reverse gravure method, a slide hopper method, a curtain method, an extrusion method, an air knife method, a rod bar coating method, and a roll coating method, can also be used.

[0032] A surfactant may be added to the coating liquid for protection stratification concerning this invention in order to improve spreading nature etc. Especially the class of surface active agent to be used may not be limited, but may be chosen from which type of an anion system, a cation system, the Nonion system, or a betaine system, and a low-molecular thing or the low-molecular thing of a macromolecule is sufficient as it. You may use combining one sort or a two or more sort surfactant.

[0033] The amount of desiccation coating of the protective layer concerning this invention has the desirable range of 0.05 - 5 g/m2. It obtains [opposite abrasion nature] fully and is not desirable if less than this range. Moreover, if this range is exceeded, the haze of a protective layer will get worse. Therefore, when considering as the sheet for OHP, using especially a bright film as a base material, since translucency gets worse, it is not desirable. Moreover, coloring of a printing part or a case, it carries out a bad influence and is not desirable. [the sheet aiming at seeing from a printing side side using an opaque base material] Since the coloring matter of ink is established in the ink acceptance layer which consists of hydrated alumina, this is because it becomes coloring in which the protective layer prepared upwards has become muddy, which is solved and which ended.

[0034] Next, the ink acceptance layer concerning this invention is explained. In advance of formation of the protective layer concerning this invention, the ink acceptance layer in the ink jet record sheet of this invention is prepared on a base material, and consists of pseudo-boehmite-like hydrated alumina at least. As for things, it is [the pseudo-boehmite-like hydrated alumina concerning this invention] desirable that 1-10nm of average pore radii consists of hydrated alumina which is 3-7nm preferably especially. This is to be hard to absorb ink, if the pore radius of hydrated alumina is too small, and for fixing of the color in ink to worsen, if a pore radius is too large, and for a blot of an image to occur.

[0035] In order for the hydrated alumina concerning this invention to have sufficient ink absorption capacity, as for the pore volume of hydrated alumina, it is desirable that it is the range of 0.3-0.8ml/g, and it is especially desirable that it is the range of 0.4-0.6ml/g. When the pore volume of an ink acceptance layer is large, there is an inclination for a crack and powder omission to occur in an ink acceptance layer, and for absorption of ink to become slow in being small. Furthermore, as for especially the solvent absorbed amount of the ink acceptance layer per unit area, it is desirable that they are two or more 10 ml/m two or more 5 ml/m. When the solvent absorbed amount per unit area is small, and multicolor printing is performed, ink may especially overflow.
[0036] In order for the hydrated alumina concerning this invention to fully absorb the color in ink and to establish it, it is desirable that it is the range whose BET specific surface area is 70-300m2/g. if a BET specific surface area is too large -- the one where pore volume distribution is larger -- a piece -- the effectiveness of fixing of the color in ink worsens and a blot of an image occurs. On the contrary, if a BET specific surface area is too small, distribution of hydrated alumina will become difficult.
[0037] In order to obtain a good ink absorption capacity, it is 30 - 50 g/m2 need preferably two or more 20 g/m in solid content as an amount of coating of an ink acceptance layer. Therefore, as for the hydrated alumina dispersion liquid used for the coating liquid for ink acceptance stratification, it is preferably desirable that it is 20% of the weight or more of concentration 15% of the weight or more. In order to raise the concentration of the dispersion liquid of hydrated alumina, as for the number of the surface water acid radicals of hydrated alumina, it is desirable that they are 1020 or more pieces/g. If there are few surface water acid radicals, it will become difficult to become easy to condense hydrated alumina and to raise the concentration of dispersion liquid.
[0038] Moreover, since the volatile alkali used in the manufacture process, for example, ammonia, triethylamine, etc. are contained, distribution is unstable, and it is usually difficult for the dispersion liquid of hydrated alumina to obtain stable dispersion liquid by 15% of the weight or more of concentration by approaches, such as concentration. Then, stable hydrated alumina dispersion liquid can be obtained at least 15% of the weight or more by removing an volatile alkali by approaches, such as evaporation to dryness, freeze-dry, or spray dry, and re-distributing the obtained powder or solid of hydrated alumina in water.
[0039] Furthermore, in order to stabilize hydrated alumina dispersion liquid, various acids may be added to dispersion liquid. As such acids, a nitric acid, a hydrochloric acid, a hydrobromic acid, an acetic acid, formic acid, a ferric chloride, an aluminum chloride, etc. can be mentioned.
[0040] Similarly, alcohol, such as a methanol, ethanol, 1-propanol, 2-propanol, 2-methoxyethanol, ethylene glycol, propylene glycol, a diethylene glycol, triethylene glycol, and a glycerol, can be added to the coating liquid for ink acceptance stratification for the purpose of stabilizing distribution of hydrated alumina. As a solvent of the coating liquid for ink acceptance stratification, the above-mentioned alcohol can be mixed in the water as an upper limit, and about 50 % of the weight can be used for it.
[0041] The ink acceptance layer concerning this invention applies and forms the coating liquid containing the pseudo-boehmite-like hydrated alumina poured on this invention at least on a base material. Moreover, you may use for this coating liquid for ink acceptance stratification for the purpose of adjusting the acidity or alkalinity of coating liquid,

coating liquid viscosity, the membrane formation nature of an ink acceptance layer, reinforcement, etc., combining a water-soluble binder two or more. All the binders illustrated by the above which it may use together especially as such a water-soluble binder to the coating liquid for protection stratification which starts this invention at least although the polyvinyl alcohol of full saponification or partial saponification is desirable in respect of miscibility with pseudo-boehmite-like hydrated alumina, adjustment of coating liquid viscosity, etc. can be used.

[0042] Moreover, when the coating liquid for ink acceptance stratification is prepared, in order to acquire good acidity or alkalinity, it is desirable to choose a water-soluble binder so that the viscosity of the coating liquid for ink acceptance stratification to prepare may be set to 100cps or more. Moreover, since spreading may become difficult when the viscosity of the coating liquid for ink acceptance stratification is too high, as for the viscosity of coating liquid, it is desirable to choose a water-soluble binder so that it may be set to 5000cps or less.

[0043] Since absorption of ink may be checked when many [if there is little amount of the water-soluble binder used in the ink acceptance layer concerning this invention, the reinforcement of an ink acceptance layer will become weak and / conversely / too], the total amount of a water-soluble binder has 5 - 20 desirable % of the weight to pseudo-boehmite-like hydrated alumina, and its 10 - 15 % of the weight is especially desirable.

[0044] When manufacturing an ink jet record sheet in this invention, even if it does not add a surfactant, good spreading nature can be obtained in many cases, but since spreading nature is improved more, a surfactant can be added for the purpose of adjusting the diameter of a dot when ink adheres to an ink acceptance layer. Although the surface active agent used has the desirable thing of the Nonion nature, it may be chosen from which type of an anion system, a cation system, the Nonion system, or a betaine system if needed, and a low-molecular thing or the low-molecular thing of a macromolecule is sufficient as it. These may be used combining one sort or a two or more sort surfactant. The addition of a surface active agent has 0.001 - 5 desirable % of the weight to the pseudo-boehmite-like hydrated alumina which constitutes an ink acceptance layer from an amount of solid content, and is 0.01 - 3 % of the weight more preferably.

[0045] Furthermore, in the ink acceptance layer concerning this invention, various well-known additives other than the above-mentioned surfactant, such as the fixing agent of an inorganic pigment, a coloring color, a color pigment, and an ink color, an ultraviolet ray absorbent, an anti-oxidant, the dispersant of a pigment, a defoaming agent, a leveling agent, antiseptics, a fluorescent brightener, a viscosity stabilizer, and a pH regulator, can also be added.

[0046] Moreover, if condensation etc. is not produced when it mixes with the dispersion liquid of pseudo-boehmite-like hydrated alumina in order to raise the definition of an image, by containing water repellent or a sizing compound in an ink acceptance layer, the diameter of a printing dot can be controlled and the definition of an image can be raised. What is generally marketed can be used as such water repellents or a sizing compound. Moreover, either a solution or the drainage system emulsion of the gestalt of such water repellents or a sizing compound is usable. The diameter of a printing dot is controllable with the addition of such water repellents to an ink acceptance layer. Although the addition changes with each component, concentration, and diameters of a printing dot to wish, it is usually 0.1 - 5 % of the weight especially preferably 0.05 to 10% of the weight

to the total solids of an ink acceptance layer as an effective formed element.
[0047] In the ink jet record sheet of this invention, the lamination of an ink acceptance layer may be a monolayer, or may be a laminating configuration. In a laminating configuration, all layers may be layers containing pseudo-boehmite-like hydrated alumina and a water-soluble binder, and you may be the laminating configuration of the layer and pseudo-boehmite-like hydrated alumina which consist of components other than the pseudo-boehmite-like hydrated alumina which includes hydrated alumina other than pseudo-boehmite-like hydrated alumina, and the layer containing a water-soluble binder.
[0048] An ink acceptance layer consists of multilayers, in the case of the layer in which all the layers contain pseudo-boehmite-like hydrated alumina and a water-soluble binder, the laminating of the same layer also as each class may be carried out, and it may carry out the laminating of the layer which has a different property. for example, in a bilayer configuration, the large layer of pore size is prepared, a lower layer can be resembled so that in favor of translucency, and the small layer of pore size can be prepared in order to gather ink rate of absorption to the upper layer, and it can make to balance ink rate of absorption and translucency etc. into the lamination doubled with the purpose.
[0049] Moreover, it can make to prepare the ink acceptance layer which turns into a lower layer of the layer which contains hydrated alumina and a water-soluble binder for the purpose of raising ink absorption capacity etc. from water soluble resin, such as polyvinyl alcohol and a polyvinyl pyrrolidone, etc. into the lamination doubled with the purpose. Moreover, although what is necessary is just to prepare the ink acceptance layer concerning this invention at least in one side of a base material, it is the purpose of preventing curl and may be prepared in both sides of a base material. When preparing an ink acceptance layer in both sides of a base material, the protective layer concerning this invention is prepared on a double-sided ink acceptance layer.
[0050] As the method of application of the coating liquid for ink acceptance stratification in this invention, the methods of application usually used, such as a slide hopper method, a curtain method, an extrusion method, an air knife method, a roll coating method, and a rod bar coating method, can be used, for example.
[0051] Although polyester film, resin covering paper, coated paper, etc. are mainly used, for example, if it is the base material which can prepare the ink acceptance layer which consists of pseudo-boehmite-like hydrated alumina concerning this inventions, such as other papers and a synthetic paper, glass, aluminium foil, vacuum evaporationo paper, a vacuum evaporationo film, a nonwoven fabric, and a textile, as a base material concerning the ink jet record sheet of this invention, it will not be limited especially.
[0052] Moreover, in order to give cushioning properties and concealment nature, the cavernous content film containing many cavities, for example, foaming polyester film etc., can be used for the interior of a film. As a base material used for this invention, although especially the thickness is not restricted, in case polyester film is used, an about 10-200-micrometer thing is desirable from handling nature and the **** fitness of a printer, and although it is not restricted especially about thickness also in case resin covering paper is used, an about 50-300-micrometer thing is desirable. However, in order to obtain the aesthetic property of the printing paper of a photograph, an about 200-300-micrometer thing is desirable.
[0053] The polyester in the polyester film used for a base material carries out the polycondensation of aromatic series dicarboxylic acid, such as a terephthalic acid,

isophthalic acid, and naphthalene dicarboxylic acid, or the ester of those, and the polyhydric alcohol, such as ethylene glycol, a diethylene glycol, 1,4-butanediol, and neopentyl glycol, is obtained, and polyethylene terephthalate, polyethylene butylene terephthalate, polyethylene -2, 6-naphthalate, the thing that copolymerized other components in these are mentioned as the example. Polyester film film-izes those polyester and orientation processing is usually carried out by processing of roll extension, tenter extension, inflation extension, etc. in many cases.

[0054] Although the paper which especially a limit does not have the stencil paper for resin covering papers, and is generally used can be used, smooth stencil paper which is preferably used for the base material for photographs is good. as the pulp which constitutes stencil paper -- natural pulp, playback pulp, a synthetic pulp, etc. -- one sort -- or two or more sorts are mixed and it is used. Additives, such as the sizing compound generally used of paper manufacture, a paper reinforcing agent, a loading material, an antistatic agent, a fluorescent brightener, and a color, are blended with this stencil paper. Furthermore, a surface sizing compound, a surface paper durability agent, the fluorescent brightener, the antistatic agent, the color, the anchoring agent, etc. may be applied to the front face.

[0055] Moreover, the good thing of surface smooth nature of the stencil paper for resin covering papers carried out [compress / during paper milling or after paper milling / a pressure / in a calender etc. / impress and] is desirable, and especially the thing for 200 seconds or more has Beck's desirable smoothness measured by JIS-P -8119. Moreover, the basis weight has desirable 30 - 250 g/m2.

[0056] Although the whiteness degree of the stencil paper for resin covering papers has a high whiteness degree in the brightness by Hunter measured by JIS-P -8123 being 65% or more and a record sheet with a high-class feeling is obtained, the whiteness degrees for which it asks for the purpose differ, are un-**(ed) as natural pulp, and may use together and use the blackish brown stencil paper using pulp. Moreover, the stencil paper colored using coloring agents, such as a color, may be used.

[0057] As covering resin for resin covering papers, polyolefin resin is desirable and especially polyethylene resin is desirable. Moreover, low density polyethylene, medium density polyethylene, high density polyethylene, or such mixture can be used. Independently, those two or more sorts can be mixed and what has various kinds of consistencies and melt flow rates can be used for these polyethylene resin. The configurations of the resin layer of resin covering paper may be multilayer any more than a monolayer and a bilayer. Also in this case, independently, two or more sorts can be mixed and the above-mentioned polyolefin resin can be used. Moreover, it can also consider considering multilayer each class as a mutually different presentation as the same presentation. As an approach of forming the resin layer which consists of a multilayer, any of a coating method may be serially adopted with a co-extrusion coating method.

[0058] On the other hand, the resin layer of resin covering paper can be formed by applying resin water distribution objects, such as a latex with film organization potency. For example, after applying resin water distribution objects, such as a latex with the low minimum membrane formation temperature (MFT), to the stencil paper for resin covering papers, they can be formed also by overheating to the temperature beyond the minimum membrane formation temperature which the resin water distribution object has.

[0059] Although there is especially no limit as thickness of the covering resin layer in resin covering paper, it is prepared in the side which generally prepares the ink acceptance layer concerning this invention in the thickness of 5-50 micrometers, or the whole surface of the opposite side or front flesh-side both sides.
[0060] In the covering resin of resin covering paper, white pigments, such as titanium oxide, a zinc oxide, talc, and a calcium carbonate, Fatty-acid amides, such as octadecanamide and an arachidic acid amide, zinc stearate, Fatty-acid metal salts, such as behenic acid zinc, calcium stearate, and magnesium stearate, Blue pigments and colors, such as cobalt blue, ultramarine blue, sicilian blue, and a copper phthalocyanine blue, The pigments and colors of a Magenta, such as cobalt violet, fast violet, and manganese purple, It can add combining suitably various kinds of additives, such as antioxidants, such as tetrakis [methylene-3-(3' and 5'-G tert-butyl-4-hydroxyphenyl) propionate] methane, a fluorescent brightener, and an ultraviolet ray absorbent.
[0061] Since both sides can form the layer of translucency practically as the ink acceptance layer which consists of the protective layer and pseudo-boehmite-like hydrated alumina which, on the other hand, contained the silica particle of the shape of a pearl necklace concerning this invention was mentioned above, it is preparing these layers in the base material of translucency, and the ink jet record sheet of translucency usable as an OHP film is obtained.
[0062] As for the base material used in case an ink jet record sheet usable as an OHP film is constituted, in this invention, it is desirable that the haze by JIS-K -7105 is 3.0 or less transparence base material. Moreover, in the ink jet record sheet which prepared the ink acceptance layer concerning this invention, and the protective layer on this base material, it is desirable that the haze by JIS-K -7105 is 10.0 or less.
[0063] In addition, in this invention, it is supposing that according to JIS-K -7105 a haze measures a luminous diffuse transmittance and total light transmission using an integrating-sphere type light transmission measuring device, and expresses by the ratio that a haze prescribes the light transmission nature as an OHP film, and the light transmission nature at the time of using it as an OHP film is because the haze is closer to people's feeling rather than expressing only with total light transmission.
[0064] In the record sheet of which the translucency of an OHP film etc. is required, although it is not necessary to restrict especially the thickness of the base material to be used, an about 50-200-micrometer thing is desirable from handling nature and the **** fitness of a printer.
[0065] A support layer may be prepared in the base material in this invention for the purpose of an ink absorbing layer and a base material, such as adhesive improvement. A support layer can be made to add combining suitably solvent fusibility binders, such as hydrophilic binders, such as gelatin, and butyral, a latex, a curing agent, a pigment, a surfactant, etc.
[0066] Moreover, various kinds of back coat layers can be painted on the base material in this invention for antistatic nature, conveyance nature, curl tightness, note nature, sizing nature, etc. A back coat layer can be made to add combining suitably an inorganic antistatic agent, an organic antistatic agent, a hydrophilic binder, a latex, a curing agent, a pigment, lubricant, a surfactant, etc.
[0067]
[Example] Hereafter, although an example explains this invention in detail, the contents

of this invention are not limited to an example.
[0068] The electron microscope image performed the judgment of whether the silica particle which had in the example and the example of a comparison, and was is a pearl necklace-like. As mentioned above, when the ratio (this ratio is hereafter described as a spherical ratio) of the sum total of the inscribed circle area for the circular part to a total projected area of a pearl necklace-like particle became 80% or more, it was presupposed that it is a pearl necklace-like.
[0069] The colloidal alumina (catalyst formation make, KATAROIDO AS- 3) of <production of ink acceptance layer> marketing was dried with the spray dryer (inlet temperature of 200 degrees C, outlet temperature of 80 degrees C), and the fine particles of pseudo-boehmite-like hydrated alumina were obtained. The ion-exchange-water 60 weight section was added to this pseudo-boehmite-like hydrated alumina 20 weight section, and the alumina sol of 25 % of the weight of solid content concentration was obtained. The 10 % of the weight water-solution (product made from Japanese synthetic chemistry, GH-23) 20 weight section of polyvinyl alcohol was added and agitated in this alumina sol 100 weight section, and the coating liquid for ink acceptance layers was prepared. about this coating liquid, a wire bar is used for a polyethylene terephthalate (PET) film with a thickness of 100 micrometers, and the amount of desiccation coating becomes 35 g/m2 -- as -- coating -- 130-degree-C hot air drying was carried out, and the "ink acceptance layer" was obtained. Both the bright film and the white film were used as a PET film. Each following example estimated by producing both a transparence article and a white article.
[0070] The 10 % of the weight water-solution (Kuraray make, PVA-117) 10 weight section of polyvinyl alcohol was added and agitated in the pearl necklace-like colloidal silica (product made from Nissan chemistry, Snow tex PS-M, SiO2 concentration [of 20 % of the weight], particle diameter [that the spherical primary particle with a particle diameter of 18-23nm combined / of 100-200nm], pearl necklace-like particle of 90% of spherical ratios) 100 weight section of example 1 marketing, and coating liquid was prepared. in this coating liquid, on an "ink acceptance layer", a wire bar is used and the amount of desiccation coating serves as 0.5 g/m2 -- as -- coating -- 130-degree-C hot air drying was carried out, and the ink jet record sheet of an example 1 was obtained.
[0071] 5 % of the weight (the Kuraray make, R-1130) of 10 % of the weight water solutions of silicon denaturation polyvinyl alcohol was added and agitated in the pearl necklace-like colloidal silica (product made from Nissan chemistry, Snow tex PS-L, SiO2 concentration [of 35 % of the weight], particle diameter [that the spherical primary particle with a particle diameter of 35-40nm combined / of 100-200nm], pearl necklace-like particle of 90% of spherical ratios) 100 weight section of example 2 marketing, and coating liquid was prepared. in this coating liquid, on an "ink acceptance layer", a wire bar is used and the amount of desiccation coating serves as 0.5 g/m2 -- as -- coating -- 130-degree-C hot air drying was carried out, and the ink jet record sheet of an example 2 was obtained.
[0072] Water was added to the spherical colloidal silica (the product made from the Nissan chemistry, the Snow tex S, particle diameter of 8-11nm) of example 3 marketing, and it considered as 5 % of the weight of SiO2 concentration. It added under stirring of 10% of the weight of the calcium chloride water-solution 8.0 weight section in this silica sol 2000 weight section, and 130 degrees C was heated under stirring for 6 hours. This

was condensed up to 20.0 % of the weight of SiO2 concentration with the ultrafiltration equipment, and the silica sol was obtained. When the silica particle of the obtained silica sol was observed with the electron microscope photograph, the configuration of 100-200nm and the shape of a pearl necklace of 80% of spherical ratios which the spherical primary particle with a particle size of 8-11nm combined was carried out.

[0073] In this way, the 10 % of the weight water-solution (Kuraray make, PVA-117) 10 weight section of polyvinyl alcohol was added and agitated in the obtained silica sol 100 weight section, and coating liquid was prepared. in this coating liquid, on an "ink acceptance layer", a wire bar is used and the amount of desiccation coating serves as 0.5 g/m2 -- as -- coating -- 130-degree-C hot air drying was carried out, and the ink jet record sheet of an example 3 was obtained.

[0074] Water was added to the spherical colloidal silica (the product made from the Nissan chemistry, the Snow tex XL, particle diameter of 40-60nm) of example 4 marketing, and it considered as 5 % of the weight of SiO2 concentration. It added under stirring of 10% of the weight of the calcium chloride water-solution 2.0 weight section in this silica sol 2000 weight section, and 130 degrees C was heated under stirring for 6 hours. This was condensed up to 20.0 % of the weight of SiO2 concentration with the ultrafiltration equipment, and the silica sol was obtained. When the silica particle of the obtained silica sol was observed with the electron microscope photograph, the configuration of 100-200nm and the shape of a pearl necklace of 85% of spherical ratios which the spherical primary particle with a particle size of 40-60nm combined was carried out.

[0075] In this way, the 10 % of the weight water-solution (Kuraray make, PVA-117) 10 weight section of polyvinyl alcohol was added and agitated in the obtained silica sol 100 weight section, and coating liquid was prepared. in this coating liquid, on an "ink acceptance layer", a wire bar is used and the amount of desiccation coating serves as 0.5 g/m2 -- as -- coating -- 130-degree-C hot air drying was carried out, and the ink jet record sheet of an example 4 was obtained.

[0076] Water was added to the spherical colloidal silica (the product made from the Nissan chemistry, the Snow tex 50, particle diameter of 20-30nm) of example 5 marketing, and it considered as 5 % of the weight of SiO2 concentration. It added under stirring of 10% of the weight of the calcium chloride water-solution 10.0 weight section in this silica sol 2000 weight section, and 130 degrees C was heated under stirring for 6 hours. This was condensed up to 20.0 % of the weight of SiO2 concentration with the ultrafiltration equipment, and the silica sol was obtained. When the silica particle of the obtained silica sol was observed with the electron microscope photograph, the configuration of 200-400nm and the shape of a pearl necklace of 83% of spherical ratios which the spherical primary particle with a particle size of 20-30nm combined was carried out.

[0077] In this way, the 10 % of the weight water-solution (Kuraray make, PVA-117) 10 weight section of polyvinyl alcohol was added and agitated in the obtained silica sol 100 weight section, and coating liquid was prepared. in this coating liquid, on an "ink acceptance layer", a wire bar is used and the amount of desiccation coating serves as 0.5 g/m2 -- as -- coating -- 130-degree-C hot air drying was carried out, and the ink jet record sheet of an example 5 was obtained.

[0078] Water was added to the spherical colloidal silica (the product made from the

Nissan chemistry, the Snow tex 50, particle diameter of 20-30nm) of example 6 marketing, and it considered as 5 % of the weight of SiO2 concentration. It added under stirring of 10% of the weight of the calcium chloride water-solution 0.5 weight section in this silica sol 2000 weight section, and 130 degrees C was heated under stirring for 6 hours. This was condensed up to 20.0 % of the weight of SiO2 concentration with the ultrafiltration equipment, and the silica sol was obtained. When the silica particle of the obtained silica sol was observed with the electron microscope photograph, the configuration of 40-100nm and the shape of a pearl necklace of 83% of spherical ratios which the spherical primary particle with a particle size of 20-30nm combined was carried out.

[0079] In this way, the 10 % of the weight water-solution (Kuraray make, PVA-117) 10 weight section of polyvinyl alcohol was added and agitated in the obtained silica sol 100 weight section, and coating liquid was prepared. in this coating liquid, on an "ink acceptance layer", a wire bar is used and the amount of desiccation coating serves as 0.5 g/m2 -- as -- coating -- 130-degree-C hot air drying was carried out, and the ink jet record sheet of an example 6 was obtained.

[0080] The 10 % of the weight water-solution (Kuraray make, PVA-117) 10 weight section of polyvinyl alcohol was added and agitated in the chain-like colloidal silica (product made from Nissan chemistry, Snow tex UP, 20 - 21 % of the weight of SiO2 concentration) 100 weight section of example of comparison 1 marketing, and coating liquid was prepared. in this coating liquid, on an "ink acceptance layer", a wire bar is used and the amount of desiccation coating serves as 0.5 g/m2 -- as -- coating -- 130-degree-C hot air drying was carried out, and the ink jet record sheet of the example 1 of a comparison was obtained.

[0081] The 10 % of the weight water-solution (Kuraray make, PVA-117) 10 weight section of polyvinyl alcohol was added and agitated in the spherical colloidal silica (product made from Nissan chemistry, Snow tex 20, 20 - 21 % of the weight of SiO2 concentration) 100 weight section of example of comparison 2 marketing, and coating liquid was prepared. in this coating liquid, on an "ink acceptance layer", a wire bar is used and the amount of desiccation coating serves as 0.5 g/m2 -- as -- coating -- 130-degree-C hot air drying was carried out, and the ink jet record sheet of the example 2 of a comparison was obtained.

[0082] The item of "abrasion-proof nature", "ink absorptivity", and a "haze" estimated the ink jet record sheet of examples 1-6 and the examples 1-2 of a comparison produced as mentioned above.

[0083] Evaluation of "abrasion-proof nature" used the friction tester (Suga Test Instruments Co., Ltd. make), pushed the gauze of cotton against the coating side of a sheet by the 400g load, performed the friction test 100 times, and made "O" what a blemish did not produce at all. Moreover, although the blemish arose somewhat in the friction test 100 times, that from which the blemish produced what a blemish did not produce at all in a friction test 20 times "**" and at least 20 times was made into "x."

[0084] Evaluation of "ink absorptivity" printed using the ink jet printer (the Seiko Epson make, PM-750C), and looked at and judged the quality. The printing image excellent in the thing of "O" was obtained. Although "**" was satisfactory practically, as compared with the thing of "O", it was inferior. The thing of "x" had the bad quality of printed character, and it was the level which has a problem practically.

[0085] Evaluation of a "haze" measured Transparence PET about the ink jet record sheet used as the base material using "NDH-300A" (JIS-K-7105 conformity) by Nippon Denshoku Industries.
[0086] Evaluation of the "60-degree specular gloss" measured the blank paper section of an ink jet record sheet, i.e., the part which omits printing, using "VGS-300A" (JIS-Z-8741 conformity) by Nippon Denshoku Industries about the ink jet record sheet which used white PET as the base material.
[0087]
[Table 1]

[0088] Each thing using the pearl necklace-like silica particle about abrasion-proof nature was good. The examples 1 and 2 of a comparison had the inadequate reinforcement of a coat.
[0089] Examples 1, 2, 4, and 5 were excellent, especially concerning ink absorptivity. As for the examples 1 and 2 of a comparison, the protective layer had checked ink absorption.
[0090] Examples 1, 2, 3, and 6 were excellent, especially concerning a haze.
[0091] As mentioned above, the ink jet record sheet which has the outstanding abrasion-proof nature, ink absorptivity, color enhancement, the transparency of a coat, and surface gloss was obtained by preparing the protective layer using the pearl necklace-like silica particle of this invention so that more clearly than Table 1. Moreover, when the particle diameter of the spherical primary particle of a pearl necklace-like silica particle was [the particle diameter of 18-40nm and a pearl necklace-like silica particle] 100-200nm, the good result was obtained especially.
[0092]
[Effect of the Invention] According to this invention, the ink jet record sheet which is excellent in surface abrasion-proof nature, and has high surface gloss and the outstanding ink absorptivity, and color enhancement is obtained, and the thing of it can be carried out.